THE SELECTIONAL RELATIONS AND CONSTITUENCY OF CLASSIFIERS IN MANDARIN CHINESE

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ABSTRACT

Yiwen Peng: The selection relations and constituency of classifiers in Mandarin Chinese
(Under the direction of Brian Hsu)

This thesis delves into classifiers (shortened as CL in the following discussion) in Mandarin Chinese, with a focus on proposing a single constituent structure to account for the syntactic positions of different categories of classifiers. I examine Zhang's (2013) split analysis, according to which the scope of delimitive adjectives indicates that different types of classifiers have distinct constituent structures and thus left- and right-branching structures are both required. In the split accounts, Mandarin classifiers that form a constituent with head nouns are represented with the right-branching structure, while those that form a constituent with numerals are represented with the left-branching structure. In this paper, I offer an account of feature checking among s-selectional features to explain the distinct scope relations between delimitive adjectives and different types of classifiers, and I argue for a consistent right-branching structure for the representation of all types of classifiers. Finally, the structure of Noun-Classifier compounds in Mandarin are discussed to argue that classifiers occur in two distinct projections, UnitP and ClP: they are initially base-generated in CL, and then move to Unit to license numerals, and this supports the unified right-branching analysis in which classifiers form a constituent with nouns first rather than with numerals.

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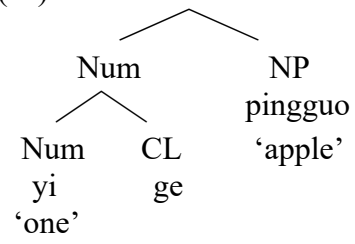
1. Introduction

Mandarin is a language in which classifiers are invariably required if a noun is combined with a numeral. For example, there is no classifier required in the phrase "four apples" in English, but classifier *ge* is required in Mandarin to render the available reading of "four apples", which is *si ge pingguo*, as is shown in (1).

(1) si ge pingguo
four CL apple
"four apples"

A variety of theories have been proposed to account for the constituent structures of classifiers in Mandarin, and one of the most controversial questions is if classifiers form a constituent with nouns or with numerals. There have been three dominant accounts for the constituency of Mandarin classifiers in recent works: (1) a unified left-branching structure, (2) a unified right-branching structure, (3) a split approach that adopts both left- and right-branching structures. Those that adopt a unified left-branching structure claim that classifiers form a constituent with the numerals as in (1a) (e.g., Huang 1982, Her 2012, Her & Tsai 2020), while others who support a unified right-branching structure propose that classifiers and nouns form a constituent as in (1b) (e.g., Cheng & Sybesma 1998, Borer 2005, Huang, Li & Li 2014, Hsu 2015). Regarding those who propose a split approach, they argue that both left- and right-branching structures are required because subtypes of classifiers determine if they should form a constituent with nouns or numerals (Y.-H. A. Li 2013, X. Li 2013, Zhang 2013).

(1a)



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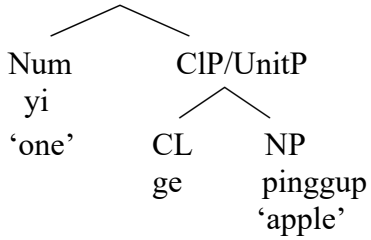


The patterns used to support each type of constituent structure involve various types of selectional relations. In this thesis, I propose a mechanism to account for one type of selectional relation, which has the benefit of permitting a unified constituent structure analysis. Unlike other accounts of UnitP in which classifiers are identified as the head Unit (Zhang 2013, Hsu 2015), I propose that UnitP and ClP are distinct projections which respectively have different functions. I claim that a functional projection UnitP projects to license the occurrence of numerals which occur as the specifier of UnitP, and that all types of Mandarin classifiers are the realizations of the head CL of a ClP which c-commands NP. With the analysis of feature checking among s-selectional features, I propose that pre-nominal classifiers undergo head movement to surface at the Unit head in order to license numerals. The uniform right-branching structure and the projection of ClP proposed in this thesis will also give a more elegant explanation on the patterning of Noun-Classifier compounds.

2. Background

This thesis largely adopts the syntactic features of classifiers in Mandarin Chinese proposed by Zhang (2013). I apply these features in my proposed s-selectional feature checking account to explain how different types of classifiers combine with head nouns and why distinct scope relations occur among classifiers and nouns when delimitive adjectives are used. Zhang (2013) proposes two syntactic features, *Numerability* and *Delimitability*. These two features are crucial because she uses them to divide nouns into different categories, such as count, non-count,

mass, and non-mass. More importantly, the delimitability feature is used to explain differences among classifiers and nouns in the acceptability of being combined with adjectives.

2.1 Numerability and Delimitability

Zhang (2013) proposes that many restrictions on the occurrence of nouns and classifiers can be explained in terms of two universal nominal features, *numerability* and *delimitability*. According to Zhang, numerability refers to the ability to directly combine with a numeral; an element that has a feature of [+Numerable] can be directly combined with a numeral, while the ones that have a feature of [-Numerable] cannot (p. 9). For example, the word *oil* cannot be directly combined with a numeral in either English or Mandarin, so it has a feature of [-Numerable] in both languages. The word *bottle* can be directly combined with a numeral in English, while it cannot be directly combined with a numeral in Mandarin when it is used to refer to an individual noun object. Hence, *bottle* has a [+Numerable] feature in English and has a [-Numerable] feature in Mandarin. In Mandarin, a classifier is always obligatory when a numeral combines with a noun. In other words, no nouns in Mandarin can directly combine with a numeral, and thus all nouns in Mandarin have a [-Numerable] feature. In English, however, some nouns have a [+Numerable] feature, while others have a [-Numerable] feature. For instance, as is illustrated in (2a) and (2b), *apple* can be directly combined with a numeral, which indicates that it has a [+Numerable] feature. However, water cannot be directly combined with a numeral, so it has a [-Numerable] feature. Although *three waters* can be acceptable within specific contexts, for instance, taking an order in a restaurant, it is similar to an ellipsis of *three cups/bottles of water*, which further suggests that *water* cannot be directly combined with a numeral. Hence, *water* has a [-Numerable] feature in English.

(2a) three apples
(2b) *three waters

The other feature she proposes is delimitablity, which determines if an element can be modified from the perspective of size (e.g., big, small), shape (e.g., round, triangle), or boundary (e.g., partly, whole) (p. 11). For example, the word *water*, in both English and Chinese, cannot be modified by delimitive adjectives, since it has no size, shape, or boundary when it is not in a certain container. As is shown through (3a) to (3e), *water* cannot be modified by a delimitive adjective in either English or Mandarin. In (3c), what is being modified is the container *bottle*, and in (3e), what is being modified is the container measure classifier *ping*. Hence, in Zhang's theory, English 'bottle' and Mandarin *ping* 'bottle' are both [+Delimitable].

(3a) *a round water
(3b) *a small water
(3c) a small bottle of water

(3d) *yi xiao shui
one small water

(3e) yi xiao ping shui
one small CL.BOTTLE water
"a small bottle of water"

One point which is worth elucidating here is that the feature of delimitability denotes the physical property of a noun and it does not refer to an intensifying meaning. There are some abstract nouns, such as *surprise*, *belief*, and *lie*, which seem to be also capable of being modified by delimitive adjectives like *big* and *small*, as in (4a) and (4b). However, in these cases, *big* and *small* express an intensifying degree reading concerned with the abstract nouns. Abstract nouns themselves, in comparison to concrete nouns like *apple*, do not have physical properties. Hence, when abstract nouns are combined with words like *big* or *small*, the adjectives are actually intensifiers instead of delimitive modifiers.

(4a) a big surprise
(4b) a big lie

According to Zhang (2013), there are four possible combinations of the two values of the features, and she uses both Numerability and Delimitability features to classify nouns into different categories. This is illustrated in Table 1.

Table 1

[Numerability]	**[Delimitability]**	**Example**	**Category**
[+Numerable]	[+Delimitable]	apple	count noun with a delimitable feature
[+Numerable]	[-Delimitable]	lie	count noun with a non-delimitable feature
[-Numerable]	[+Delimitable]	furniture	non-count, non-mass
[-Numerable]	[-Delimitable]	water	mass noun

As she proposes, a word with a [+Numerable] feature, no matter what delimitable feature value it has, is denoted as count. As is shown in Table 1, *apple* and *lie* can be both directly combined with a numeral in English, which indicates that they have a [+Numerable] feature, and Zhang (2013) proposes that nouns that have a [+Numerable] feature are count nouns even though their delimitability features may differ from one another. With regard to nouns that have a [-Numerable] feature, we can still identify a distinction between [+Delimitable] and [-Delimitable] ones. For instance, *furniture* and *water*, as is shown in Table 1, can be neither directly combined with a numeral in English, so they both have a [-Numerable] feature. However, Zhang (2013) argues that [-Numerable] feature itself is not sufficient to classify nouns as mass nouns; non-count nouns are not necessarily mass since some of them can be modified by physical properties, whereas mass nouns cannot be modified by physical properties like size, shape, or boundary. For example, *furniture* can be modified by size, which indicates that it has a [+Delimitable] feature. *Water*, however, cannot be modified by size, shape, or boundary, so it has a [-Delimitable] feature. Zhang

(2013) proposes that mass nouns are nouns that have a [-Numerable] and [-Delimitable] feature, like *water* in English, and that nouns that have a [-Numerable] and [+Delimitable] feature are non-count but also non-mass nouns, like *furniture* in English (p. 15).

In Mandarin, a classifier is invariably obligatory when a noun is combined with a numeral, so all nouns in Mandarin have a [-Numerable] feature.

Table 2

[Numerability]	**[Delimitability]**	**Example**	**Category**
[-Numerable]	[+Delimitable]	pingguo 'apple'	non-mass noun
[-Numerable]	[-Delimitable]	shui 'water'	mass noun

As is illustrated in Table 2, nouns in Mandarin can be divided into two main categories based on the two nominal features proposed by Zhang (2013), which are mass nouns that have a [-Delimitable] feature and non-mass nouns that have a [+Delimitable] feature (p. 35). Since all nouns in Mandarin are non-count nouns with a [-Numerable] feature, classifiers are the only bearer of the numerability feature. Hence, all classifiers in Mandarin have a [+Numerable] feature. I will further discuss the delimitability features of different types of classifiers in later sections.

2.2 Different types of CLs

According to Zhang (2013), Mandarin classifiers can be classified into different categories in terms of what type of nouns they occur with. More specifically, Zhang (2013) divides them into classifiers that occur with [-Delimitable], [+Delimitable], and [± Delimitable] nouns. The features of classifiers are significant for the later analysis of developing a uniform constituent structure to account for the syntactic projections of classifiers in Mandarin.

2.2.1 Individuating CLs

Mass nouns in Mandarin, as discussed earlier, have a feature of [-Numerable] and [-Delimitable], so they cannot be directly combined with numerals or delimitive modifiers. Zhang (2013) refers to classifiers that portion mass nouns into countable units as *individuating classifiers*. More importantly, the unit denoted by individuating classifiers can be characterized in terms of size, shape, or boundary, which means a delimitive modifier can be used to modify the noun phrase when an individuating classifier is encoded with the noun. The word *oil* is a mass noun in Mandarin which can neither be directly combined with a numeral nor be modified by a delimitive modifier, as is shown in (5c) and (5d). However, as is illustrated in example (5a) and (5b), the word *oil* can combine with a numeral and a delimitive modifier only if an individuating classifier, like *di* 'drop', is used. Hence, individuating classifiers have the features [+Numerable] and [+Delimitable].

(5a) yi di you
one CL.DROP oil
"one drop of oil"

(5b) yi da di you
one big CL.DROP oil
"one large drop of oil"

(5c) *yi you
one oil
intended: one drop of oil

(5d) *da you
big oil
intended: a big drop of oil

2.2.2 Collective, partitive, and individual CLs

Non-mass nouns in Mandarin, according to Zhang (2013), have a feature of [+Delimitable], and they have their own "natural unit" which signifies one complete entity of a non-mass noun. When their natural unit is referred to in a numeral expression, *individual classifiers* are used. For example, if *pingguo* 'apple' needs to be combined with a numeral and its natural unit is used for counting, the individual CL *ge* will be used in this situation, as is illustrated in (6a) and (6b).

(6a) yi ge pingguo
one CL apple
"one apple"
(6b) san ge pingguo
three CL apple
"three apples"

When the counting unit is bigger than the noun's natural unit, a *collective classifier* is used for counting. For instance, *dui* is a collective CL which means "pile", and it provides one counting unit in which multiple natural units of an object are included. As illustrated in example (6a) and (7), when the classifier is changed, a different reading is achieved as well. In (6a), there is only one apple denoted, while in (7) there are multiple apples denoted, and this is achieved by using a collective classifier to change the counting unit.

(7) yi dui pingguo
one CL.PILE apple
"one pile of apples"

(8) san pian pingguo
three CL.SLICE apple
"three slices of apple"

When the counting unit is smaller than an object's natural unit, a *partitive classifier* is used for counting. For example, *pian* is a partitive classifier that is frequently used to denote a slice of an entity. In (8), three are three slices of apple referred to, and these three slices do not necessarily need to be taken from the same complete apple. The significant information conveyed by using the partitive classifier *pian* is that the counting unit is smaller than the natural unit of an apple.

One of the characteristics of collective and partitive CLs that differs from those of individual classifiers is that, like [+Delimitable] nouns, they can be modified by delimitive adjectives. As is illustrated in (9a), the collective classifier *qun* 'group' is modified by the delimitive modifier, and the head noun in (9a) is not the modifiee, as reflected in the gloss. In example (9b), however, there are two delimitive modifiers which can respectively modify the classifier and the head noun.

(9a) yi da qun yang
one large CL.GROUP sheep
"a large group of sheep"

(9b) yi da qun xiao yang
one large CL.GROUP small sheep
"a large group of small sheep"

With regard to individual classifiers, they are different from collective and partitive ones in terms of their delimitability feature. First of all, individual classifiers are frequently semantically vacuous or semantically redundant. For example, the individual classifier *ge* in (10a) and (10b) does not have any meaning and thus is semantically vacuous. (10a) and (10b) have exactly the same meaning, 'a big apple', no matter if the delimitive adjective *da* 'big' directly precedes the classifier *ge* or the head noun *pingguo* 'apple'. In (10c) and (10d), the classifier *tiao* has a meaning of 'strip', but it does not contribute its meaning to the whole phrase. Similar to (10a) and (10b), whether or not the delimitive adjective *da* 'big' directly precedes the head noun does not affect the

reading of ‘a big fish’, which indicates that the individual classifier *tiao* is semantically redundant even though it has a meaning. I argue that such patterns suggest that individual classifiers, unlike other types of classifiers, do not have a delimitability feature.

(10a) yi da ge pingguo
one big CL apple
“a big apple”

(10b) yi ge da pingguo
one CL big apple
“a big apple”

(10c) yi da tiao yu
one big CL.STRIP fish
‘a big fish’

(10d) yi tiao da yu
one CL.STRIP big fish
‘a big fish’

Another good example to indicate that individual classifiers do not have the delimitability feature is the incompatibility of some delimitive modifiers within the same numeral expression. In English, if there is a group of small apples and a speaker is trying to refer to an apple that is bigger than the rest within this small apple group, then he may say, ‘Look, there is a big small apple’. In this context, *a big small apple* is grammatical even though *big* and *small* are antonyms. In Mandarin, however, delimitive modifiers that are antonyms to one another are not compatible within the same numeral expression in which an individual classifier is used.

(11) *yi da ge xiao pingguo
one big CL small apple
intended: “a big small apple”

As is shown in (11), *a big small apple* is illicit in Mandarin, even though a context that is mentioned above is provided. This suggests that individual classifiers do not have the delimitability feature. I will further discuss other types of classifiers’ delimitability feature in Section 5.

2.3 Zhang's proposal

In Mandarin, it is possible to use two antonym delimitive modifiers in a single nominal expression, but it depends on the type of classifier present. For example, in (12), an individual classifier *zhi* is used, which refers to one sheep. In this situation, *da* 'big' and *xiao* 'small' are incompatible. In (13), the numeral, delimitive adjectives, and the head noun are all identical, but a collective classifier is used, which refers to a group of sheep. The change of a classifier provides an available reading and enables the two delimitive adjectives to co-occur, which are incompatible in (12).

(12) *yi da zhi xiao yang
one big CL small sheep
intended: 'a large small sheep'

(13) yi da qun xiao yang
one big CL.GROUP small sheep
'a large group of small sheep'

Zhang (2013) claims that the delimitive adjectives in (12) have the same scope which explains why they both modify the head noun. The delimitive adjectives in (13), however, have different scopes which indicates that they modify different elements and thus are compatible. To explain why delimitive adjectives may have same or different scope, Zhang (2013) proposes, 'two incompatible modifiers may co-occur if they have scope over separate constituents' (p. 157).

More specifically, she argues that an adjective that precedes the classifier has a wide scope, which modifies both the classifier and the head noun, only if a classifier and the head noun form one constituent. However, if a classifier and the head noun do not form a constituent in a numeral

expression, the adjective that precedes the classifier has a narrow scope, which only modifies the classifier but not the head noun. Additionally, she proposes that a *semantic-selection relation* (shortened as s-selection) can be used to diagnose if a classifier and the head noun form one constituent. An s-selection relation refers to a pattern in which a selector element must occur with a selectee element that fulfills a semantic requirement. For instance, she gives an example of the individual classifier *pie* 'stroke', which s-selects nouns that have a shape of and resemble a 'stroke', like *huzi* 'mustache'. Nouns that do not fulfill the s-selection relation, like *pingguo* 'apple', cannot be selected by the individual classifier *pie* 'stroke' and thus cannot combine with *pie* 'stroke'. With the s-selection relation, Zhang proposes two different branching structures, left- and right-branching structures, to represent how distinct categories of classifiers are represented in numeral constructions: classifiers that s-select head nouns are represented with a right-branching structures and those do not s-select head nouns are represented with a left-branching structure. More specifically, she argues that individual, individuating, and kind classifiers need to s-select properties of nouns, so they are represented with left-branching structures. Collective, partitive, and container and standard measure classifiers, however, do not s-select head nouns, so they are represented with right-branching structures.

For example, in (14), a collective classifier is used, and, according to Zhang (2013), it does not s-select nouns and thus does not form a constituent with the head noun *yang*. Since the classifier and the head noun belong to separate constituent structures, the adjective here has a narrow scope, which only modifies the classifier *qun* but not the head noun *yang* 'sheep'. In (15), however, an individual classifier *zhi* is used, which s-selects the property of being an animal and thus forms a constituent with the head noun. Hence, the adjective here has a wide scope, which modifies both the classifier *zhi* and the head noun *yang* 'sheep'.

(14) yi da qun yang
one large CL sheep
"a large group of sheep"

(15) yi da zhi yang
one large CL sheep
"a large sheep"

Zhang (2013)'s proposal on the scope of the adjectives crucially assumes that an adjective can only modify another element if the adjective c-commands it. Figure 1 illustrates how example (14) is represented with the left-branching structure in which a collective classifier is used, and figure 2 shows the right-branching structure of example (15) in which an inidvidual classifier is used.

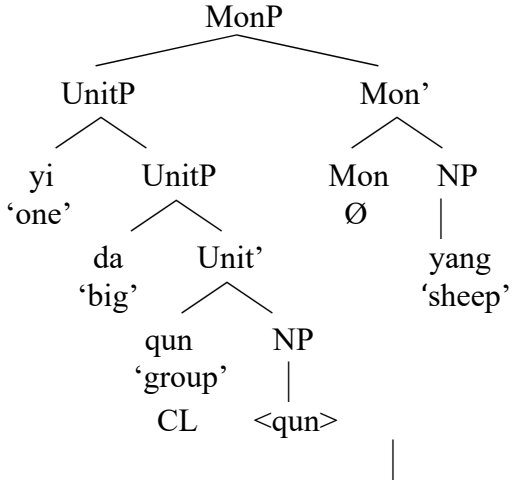


Figure 1

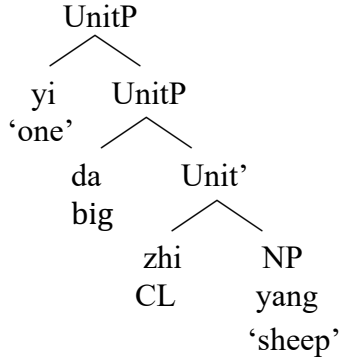


Figure 2

(Zhang 2013, p. 232, 235)

Zhang (2013) proposes that numerals occur in a functional projection named Unit Phrase and that numerals and classifiers are in a specifier-head relation. More specifically, she proposes that classifiers that are represented with the right-branching structures are base-generated at the Unit head, as is shown in Figure 1, whereas classifiers that are represented with the left-branching structures are originally base-generated in NP and eventually undergo head movement to surface in the Unit head, as is shown in Figure 2 (p. 234). In addition, she proposes that MonP (for

Monotonicity Phrase) projects in left-branching structures, and this UnitP is the specifier of MonP. In left-branching structures, she proposes that head nouns are base-generated as an NP complement of Mon, as shown in Figure 2. (p. 234-235).

Zhang (2013) uses s-selection relation as a diagnostic for constituent structure, and I argue that this is problematic because other mechanisms can better account for the s-selection relation. Specifically, I argue that s-selection involves a feature checking relationship rather than constituent structure, and this allows for a uniform right-branching structure analysis. I propose that UnitP, no matter what type of classifier being the Cl head, always dominates the ClP and NP is always the complement of ClP.

3. Problems with a split approach

Although Zhang (2013)'s proposal gives us a good classification of nouns and classifiers, the structures she proposes to account for the syntactic positions of classifiers are untenable in many respects. First of all, she relies on the assumption that classifiers in Mandarin are nominals and argues that classifiers that are represented in the left-branching structure are originally base-generated in NP and eventually move to the Unit head. However, it is inappropriate to propose that classifiers are originally base-generated in NP because Mandarin classifiers are not necessarily of nominal origin. I will further discuss this issue in section 3.1. Second, she uses semantic selection to diagnose if classifiers and head nouns should form a constituent in numeral expressions. In Section 3.2, I will point out why it is inappropriate to use semantic selection to determine if two elements form a constituent. Third, when it comes to the discussion of *N-CL compounds* (Noun-Classifier Compound), which will be discussed in a later section, she proposes collective and partitive classifiers have different structures. However, this conflicts with her previous argument that collective and partitive classifiers are both represented in the left-branching structure.

3.1 The origins of classifiers

Zhang (2013) supports the left-branching analysis in which classifiers are generated as NPs with the claim that Mandarin classifiers are of nominal origin, and this claim is shared with many syntactic analyses of Mandarin classifiers. Wang (1943) proposes classifiers as a special type of nouns, and Cheng and Sybesma (1998: 14-17) propose that all classifiers have nominal origins. According to Cheng and Sybesma (1998: 14-17), classifiers are divided into count classifiers, which cannot stand alone as independent nouns and thus form a closed class, and mass classifiers, which can stand alone as independent nouns and thus belong to an open class.

I first argue that Zhang does not explain why some classifiers are base-generated in NP whereas others are not, if all Mandarin classifiers, based on her assumption, are of nominal origin. Second, there is evidence that not all classifiers have nominal origins. According to Li (2013), "classifiers in Mandarin grammaticalize from different categories, which can be nouns, verbs, or adjectives" (p. 24). For example, as is illustrated in (16), *kun* was originally a verb that referred to the action of binding something into a bundle, whereas it can also be used as a collective classifier. In (17), *wan* is originally an adjective which means 'curved', while it is used as an individual classifier here.

(16) yi kun daocao
one CL.BUNDLE straw
'a bundle of straws'

(17) yi wan mingyue
one CL.CURVED moon
'a cresent of moon'

(Li. 2013)

The examples above demonstrate that classifiers are derived from several word classes in Mandarin. In addition, not all Mandarin classifiers can stand alone as independent nouns (Li 2013: p. 25).

(18) yi wan shui
one CL.bowl water
'a bowl of water'

(19) yi ge wan
one CL bowl
'a bowl'

(20) yi pian xigua
one CL.SLICE watermelon
'one slice of watermelon'

(21) *yi ge pian
one CL CL.SLICE

(22) yi dui xigua
one CL.PILE watermelon
'a pile of watermelons'

(23) *yi ge dui
one CL CL.PILE

For example, *wan* is used as a container measure classifier in (16), and it can stand alone as a noun along with an individual classifier *ge* in (17). This indicates that container measure classifiers have a high degree of nominal properties, which Zhang uses as evidence to support her proposal that left-branching classifiers, which in her approach include collective, partitive, container and standard measure classifiers, are base-generated as NPs and undergo head movement to Unit. However, partitive and collective classifiers, unlike container measure ones, have a low degree of nominal properties, which conflict with Zhang's proposal. As is illustrated in example (18) and (20), *pian* and *dui* are respectively partitive and collective classifiers, both of which are represented in the left-branching structure and originally base-generated in NP in Zhang's theory. However,

they cannot function as independent head nouns and occur with other classifiers, like container measure classifiers. Hence, this casts doubt on the claim that partitive and collective classifiers are also base-generated in NP and undergo head movement to surface at Unit.

3.2 The issue of S-selection

Zhang (2013) argues that classifiers that s-select head nouns, specifically, individual, individuating, and kind classifiers, form a constituent with the head noun in the right-branching structure. With respect to classifiers that do not s-select head nouns, specifically, collective, partitive, standard and container measure classifiers, she proposes that they do not form a constituent with the head noun and thus are represented with the left-branching structure.

For example, as is illustrated in (22), *gen* is an individual classifier which is used to refer to nouns that have a shape of a strip, such as stick, sausage, sugarcane et cetera. It s-selects the physical property of strip when it is combined with a noun; if the head noun does not have a shape of a strip, *gen* cannot be used with the head noun, as is shown in (23). In (24) and (25), *qun* is a collective classifier, and Zhang claims that collective classifiers like qun do not s-select head nouns, and neither do partitive, standard, and container measure classifiers.

(22) liang gen mugun [Individual]
two CL stick
'two sticks'

(23) *liang gen zhuozi [Individual]
two CL desk
intended: two desks

(24) yi qun yang [Collective]
one CL.GROUP sheep
'a group of sheep'

(25) yi qun ren [Collective]
one CL.GROUP people
'one group of people'

I first argue against Zhang's claim that the left-branching structure classifiers in her theory do not s-select head nouns. In other words, s-selection relations also appear between the head nouns and the left-branching classifiers in Zhang's theory. For instance, in (24) and (25), the head nouns are respectively *yang* 'sheep' and *ren* 'people', which are both animate, and it is acceptable to have the collective classifier *qun* combine with them. However, the collective classifier qun 'group' is only compatible with animate head nouns. For example, in (26), the head noun is *pingguo* 'apple', which is inanimate. Under Zhang's proposal, *qun* should also be able to combine with *pingguo* 'apple' because left-branching classifiers *qun* should not have s-selection relations with nouns. However, this is ungrammatical because *qun* as a collective classifier s-selects animate nouns when it is combined with a head noun. According to her theory, this would indicate that collective classifiers may also form a constituent with the head noun, and thus they should be represented with the right-branching structure like individual and individuating classifiers. This conflicts with her proposal that collective classifiers are represented with the left-branching structure.

(26) *yi qun pingguo [Collective]
one CL.GROUP apple
intended: a group of/a lot of apples

Zhang builds her theory with the assumption that two elements must form a constituent if there is an s-selection relation between them. However, I argue that an s-selection relation is not a reliable diagnostic to determine if two elements form one constituent, because s-selection is also found between elements that do not form constituents, to the exclusion of other items, such as a main verb and the complementizer of a selected embedded clause. For example, Grimshaw (1979) proposes that the main verbs that take embedded clause complements require a semantic frame which enables main verbs to select properties of the embedded complementizer. In other words,

the sentence is well-formed on condition that the complementizer fulfills the requirement of the semantic frame. For instance, she proposes that verbs like *wonder* and *ask* have the [___Q] frame: *wonder* and *ask* s-select a complementizer with a Q (question) feature, such as *if* and *whether*.

(27) Jason wonders if John was here last night.

(28) *Jason wonders that John was here last night.

As Figure 2.1 illustrates, the [_Q] frame of *wonder* s-selects the feature Q of *if*, whereas *wonder* and *if* do not form a constituent.

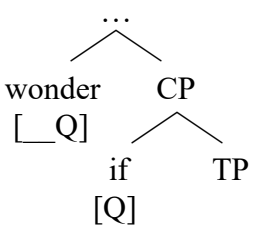


Figure 2.1

As is shown in (27) and (28), when the complementizer does not fulfill the [___Q] frame, the sentence is not grammatical. This only indicates that a s-selection relation is crucial to determining the well-formedness of a sentence, but it is not sufficient to indicate that two elements form one constituent.

Further evidence is found through the movement test; as shown in (27a) and (27b), the embedded clause *if John was here last night* can be moved as a single unit within the sentence, whereas complementizer *if* cannot. This indicates that *wonder* and its complementizer do not form one constituent.

(27a). Jason wonders [$_{CP}$if John was here last night.]
(27b). [$_{CP}$if John was here last night], Jason wonders.

In sum, the s-selectional relation between a CL and a noun, or absence thereof, does not provide evidence for CL and noun forming a constituent. In the next section, I propose that the s-selection relation can be better accounted for by feature checking.

4. The scope of delimitive adjectives

As is discussed in section 1, when delimitive adjectives immediately precede classifiers rather than head nouns in numeral expressions, sometimes it is the classifiers that are being modified while sometimes it is the head nouns that are being modified, as is show in example (14) and (15).

(14) yi da qun yang
one large CL.GROUP sheep
"a large group of sheep"

(15) yi da zhi yang
one large CL.ANIMAL sheep
"a large sheep"

I argue against Zhang's claim that different scope relations are explained in terms of different constituent structures. Specifically, I propose that different scope relations are determined by differences in the delimitability properties of different classifiers and can be explained with a process of s-selectional feature checking which happens among delimitive adjectives, classifiers, and head nouns.

Zhang (2013) divides classifiers into subclasses based on the delimitability properties of nouns they occur with. According to her theory, Mandarin classifiers have different requirements on the delimitability properties of nouns they occur with, as summarized in Table 3. For example, *tiao* 'strip' is an individual classifier which requires the noun it combines with have the feature [+Delimitable], and *di* 'drop', as an individuating classifier, requires the nouns have the feature [-Delimitable] to combine with it.

Table 3

Category	*Delimitability properties of nouns*
Individuating classifiers	[-Delimitable]
Collective, Partitive, Individual classifiers	[+Delimitable]
Kind, Container measure, Standard measure classifiers	[± Delimitable]

I argue that a similar s-selection process is also found among classifiers, nouns, and delimitive adjectives when they are combined with one another, and that a similar frame as the one proposed by Grimshaw (1979) can be used to account for the pattern of s-selection. Specifically, I propose that classifiers, nouns, and delimitive adjectives participate in the relation of s-selection, represented with the notation in (3a) (Merchant 2019).

(3a) $\begin{bmatrix} \text{SEL}[\text{ F}] \\ F \end{bmatrix}$

- *F* represents the inherent features
- SEL[F] represents the selection feature

(3b) $\begin{bmatrix} \text{SEL } [+\text{Delimitable}] \\ +\text{Numerable} \end{bmatrix}$

F refers to the inherent semantic properties of the head X, and the SEL[F] indicates s-selection: the element that combines with head X must have feature F as its inherent property. For example, the individual classifier *ge* has the inherent feature [+Numerable], so *F* refers to [+Numerable]. In terms of its selection feature, *ge*, as an individual classifier, needs to occur with a noun that has the feature [-Delimitable], so the selection feature of *ge* is SEL[+Delimitable]. Represented within one frame, the individual classifier *ge* has the notation shown in (3b).

With some slight differences, the s-selectional frame in (3a) can also be applied to show the selectional requirements of delimitive adjectives and nouns, and, more importantly, to account for the scope differences when delimitive adjectives precede classifiers of different types. I propose that all delimitive adjectives have the s-selection feature SEL[+Delimitable], which indicates that they must modify an item that has the feature [+Delimitable]. In other words, delimitive adjectives, unlike classifiers, are selectors only, and they do not have inherent semantic properties *F*, such as [+Numerable] and [+Delimitable]. Unlike delimitive adjectives, nouns only have inherent semantic properties, which are [-Numerable] and [±Delimitable]. Since nouns do not have a selection feature, like SEL[+Delimitable], they are selectees only.

I propose that an element is modified when its inherent feature [+Delimitable] checks the selection feature SEL[+Delimitable] of delimitive adjectives. Specifically, nouns and classifiers that have the feature [+Delimitable] become candidates for delimitive adjectives to s-select.

As shown in Figure 3.1, the individual classifier *ge* has only one inherent feature, [+Numerable], and a selection feature, SEL[-Delimitable]. This indicates that *ge* is always a selector but optionally a selectee. As a selector, *ge* s-selects a noun that has the feature [+Delimitable]. As a selectee, it can be s-selected by any element that has a selection feature SEL[+Numerable]. The head noun *pingguo* 'apple' has the inherent features [-Numerable] and [-Delimitable] and no selection features, which indicates that it can only be s-selected by any element that has the selection features SEL[-Numerable] or SEL[-Delimitable]. The adjective *da* only has the selection feature SEL[+Delimitable], which indicates that *da* can only be a selector and s-select an element that has the feature [+Delimitable]

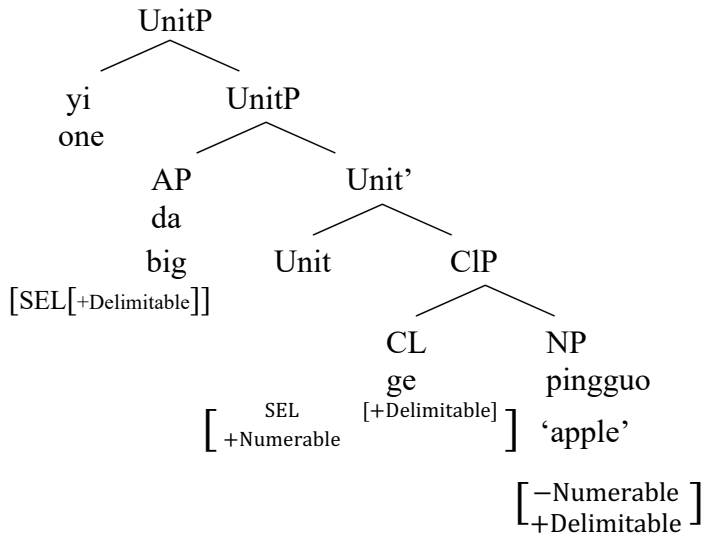


Figure 3.1

According to the featural analysis, the individual classifier *ge* does not have an inherent feature that fulfills the s-selectional requirement of delimitive adjective *da*, so *ge* is not the actual modifiee and *da* needs to find other elements to fulfill its selectional requirement. The head noun *pingguo* 'apple' is the only element that has the inherent feature [+Delimitable] in this phrase, which fulfills the s-selectional requirements of both the individual classifier *ge* and the delimitive adjective *da*. Hence, the head noun *pingguo* is the actual modifiee, and this explains why delimitive adjectives scope over head nouns when an individual classifier is used.

In (28), a collective classifier *qun* 'group' is used, which has inherent features of [+Numerable] and [+Delimitable] and the selection feature SEL[+Delimitable]. This indicates that *qun* must be a selector but optionally a selectee. As a selector, it s-selects a noun that has the feature [+Delimitable]. It can be selected by an element that has selection features SEL[+Numerable] or SEL[+Delimitable]. The head noun *yang* only has the inherent features [-Numerable] and [+Delimitable] and thus can only be a selectee. The delimitive adjective *da*, as discussed above s-selects an element that has the feature [+Delimitable].

(28) yi da qun yang
one large CL sheep
"a large group of sheep"

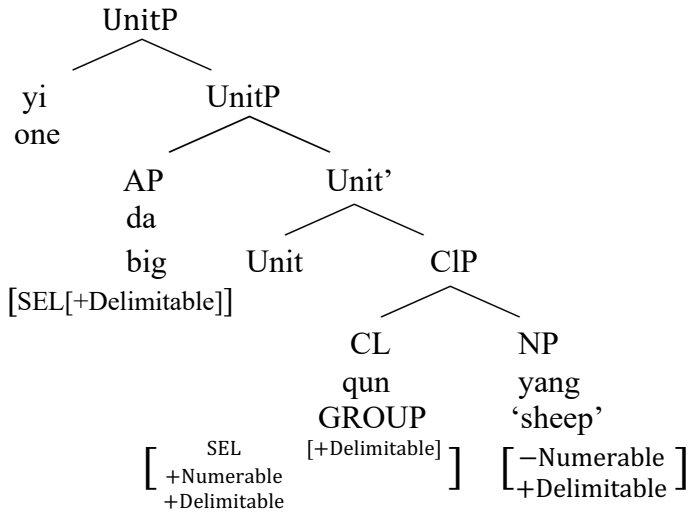


Figure 3.2

As Figure 3.2 illustrates, two candidates fulfill the s-selectional requirement of *da*, the classifier *qun* and the head noun *yang*. I propose that s-selection is subject to a locality restriction: when a delimitive adjective s-selects an item with the feature [+Delimitable], it picks the hierarchically closest candidate. In this example, although both *qun* 'group' and *yang* 'sheep' are candidates and can be s-selected by *da*, *da* stops searching when it finds *qun* 'group'. Hence, the classifier *qun* 'group' is the actual modifiee.

However, if *da* is adjoined to the NP rather than the UnitP, as is shown in Figure 3.3 and example (29), *yang* 'sheep' becomes the only candidate when it searches for an element that fulfills its s-selectional requirement. Therefore, the actual modifiee cannot be the classifier *qun* 'group' but the head noun, and the reading of 'big sheep' is required but not 'big group'.

(29) yi qun da yang
one CL.GROUP big sheep
"a group of large sheep"

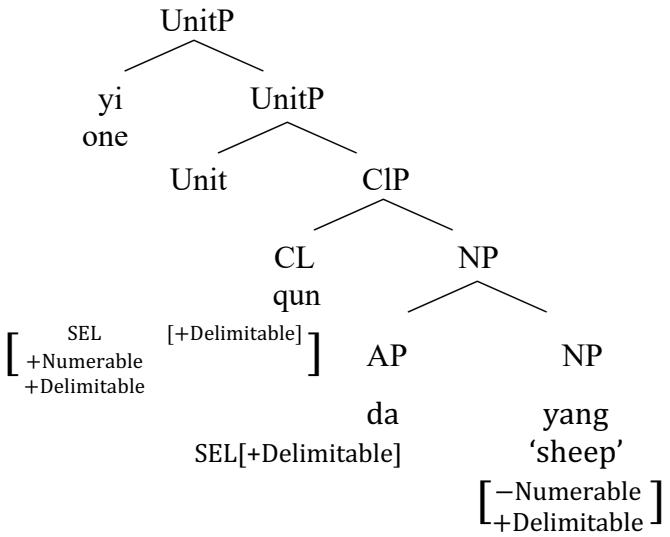


Figure 3.3

In sum, I propose to use s-selectional features to account for the differences among classifiers in whether they can be modified by delimitive adjectives that preceded them, and the theory of s-selectional feature checking accounts for the different scope relations in numeral expressions.

5. The features on CLs

In addition to the numerability and delimitability distinctions of nouns, Zhang investigates classifiers in terms of these two features as well. As is discussed earlier, she claims that all nouns in Mandarin have the feature [-Numerable] which explains why a classifier is always obligatory with a numeral expression. According to her theory, Mandarin classifiers, as 'the unique numberability bearers in numeral expressions', have the feature [+Numerable] (p. 50). With regard to the delimitability features of Mandarin classifiers, she proposes that all Mandarin classifiers have the feature [+Delimitable] except kind and standard measure classifiers, and she uses the examples in (30) through (31) to support her argument.

(30) san chang tiao xianglian [Individual CL]
three long CL.STRIP necklace
"three long necklaces"

(31) san da di you [Individuating CL]
three big CL.DROP oil
"three big drops of oil"

According to Zhang (2013), individual classifiers, like *tiao* in (30), are represented in the right-branching structure. She claims that right-branching structure explains why delimitive adjectives scopes over both the classifier and the head noun; with the right-branching structure, the delimitive adjective c-commands the classifier and the head noun and thus modify both of them. For example, in (30), *chang* 'long' scopes over both *tiao* 'strip' and *xianglian* 'necklace', so *chang* modifies both the individual classifier and the head noun. Similarly, an individuating classifier *di* 'drop' is used in example (31), which is also represented with the right-branching structure in her theory. Zhang claims that *da* 'big' in (31) scopes over both *di* 'drop' and *you* 'oil', and the impossibility of modifying *you* 'oil' is due to the fact that *you* 'oil' has the feature [-Delimitable].

(32) san da pian xigua [Partitive CL]
three big CL.SLICE watermelon
"three big slices of watermelon"

(33) san da qun yang [Collective CL]
three big CL.GROUP sheep
"three big flocks of sheep"

In (32) and (33), a partitive and a collective classifier are used, which are represented with the left-branching structure in her theory. Delimitive adjectives only c-command classifiers but not head nouns when they precede classifiers in the left-branching structure, so they only scope over classifiers. For example, in (32) and (33), partitive classifier *pian* and collective classifier *qun* are both represented with the left-branching structures, so the delimitive adjectives *da* 'big' only scopes over these two classifiers but not the head nouns *xigua* 'watermelon' and *yang* 'sheep'.

(34) *san da zhong yang [Kind CL]
three big CL.KIND sheep
intended: three big kinds of sheep

(35) *san da jin yang [Standard meaure CL]
three big CL.KILOGRAM sheep
intended: three big kilograms of sheep

With regard to kind and standard measure classifiers, they cannot be grammatically preceded by a delimitive adjective, as demonstrated in (34) and (35). Hence, the delimitive adjectives can never c-command kind or stand measure classifiers, and this indicates that kind and standard measure classifiers cannot be modified by delimitive adjectives anyway. In the final analysis, Zhang (2013) concludes that kind and standard measure classifiers may not be modified by any delimitive modifier in Mandarin and thus have the feature [-Delimitable], whereas all other types of CLs have the feature [+Delimitable] (p. 51).

I agree with Zhang's proposal that all Mandarin classifiers are the unique bearers of numerability feature and thus have the feature [+Numerable] due to the fact that they are always obligatory in numeral expressions. However, I argue against her claim that all mandarin classifiers have the feature [+Delimitable] except kind and stand measure classifiers. Specifically, I argue that individual classifiers do not have the delimitability feature.

Similar to nouns, classifiers that cannot be modified by delimitive adjectives do not allow delimitive adjectives directly preceding them and thus have the feature [-Delimitable]. Hence, kind and standard measure classifiers, as in (34) and (35), have the feature [-Delimitable].

(34) *san da zhong yang [Kind CL]
three big CL.KIND sheep
intended: three big kinds of sheep

(35) *san da gongjin yang [Standard meaure CL]
three big CL.KILOGRAM sheep
intended: three big kilograms of sheep

However, not all classifiers that can be directly preceded by delimitive adjectives have the feature [+Delimitable]. To diagnose if a classifier has the feature [+Delimitable] when it can be directly preceded by delimitive adjectives, I propose to investigate if it can be an actual modifiee: if a classifier is not the actual modifiee when it is directly preceded by a delimitive adjective, then it does not have the delimitability feature. The approach to test if a classifier is an actual modifiee is to investigate whether or not the syntactic position change of delimitive adjective results in a change in the meaning of the numeral phrase: if the change of delimitive adjectives' syntactic position does not influence the original numeral expression's reading, then the classifier is not the actual modifiee and thus has the feature [-Delimitable]. If the change of delimitive adjectives' syntactic position leads to a new reading or change grammaticality, then the classifier is the actual modifiee and thus has the feature [+Delimitable].

(30) san chang tiao xianglian [Individual CL]
three long CL.STRIP necklace
"three long necklaces"

(36) san tiao chang xianglian [Individual CL]
three CL.STRIP long necklaces
"three long necklaces"

(37) san da qun yang [Collective CL]
three big CL.GROUP sheep
"three big flocks of sheep"

(38) san qun da yang [Collective CL]
three CL.GROUP big sheep
"three groups of big sheep"

For example, delimitive adjective in (36) immediately precedes the head noun instead of preceding the individual classifier, and (29) and (36) have the identical meaning. In (37) and (38), however, the change of the delimitive adjective's position leads to a different reading. In (37), the actual modifiee is the collective classifier *qun* rather than the head noun *yang* 'sheep', so a reading

of ‘big group of’ is reached. In (38), when the delimitive adjective precedes the head noun instead of the collective classifiers, the reading of ‘big group’ is no longer possible, and the reading of ‘big sheep’ is possible. In comparison to (37), *chang tiao* in (29) does not convey any available reading, and this indicates that the individual classifier *tiao* cannot be modified and that the head noun *xianglian* ‘necklace’ is the actual modifiee. Hence, I conclude that delimitive adjectives only modify the head nouns rather than individual classifiers even when they immediately precede individual classifiers. Since individual classifiers are not being modified when they are directly preceded by delimitive adjectives, they are not the actual modifiees and thus do not have the delimtability feature. Collective classifiers, on the other hand, are actual modifiees when they are preceded by delimitive adjectives. As a consequence, collective classifiers have the feature [+Delimitable].

I use example (39) and example (40) to support my argument that individual classifiers do not have the delimitability feature and collective classifiers have the feature [+Delimitable]. In (39) and (40), there are two delimitive adjectives, which are antonyms, respectively preceding the classifiers and the head nouns. Suppose the individual classifier *tiao* ‘strip’ in (39) has the [+Delimitable] feature as Zhang proposed, then (39) should also be grammatical like (40). However, (39) is ungrammatical, and I argue that this is because the individual classifier *tiao* ‘strip’ does not have the delimitability feature. The lack of delimitability feature, unlike having the feature [-Delimitable], does not prevent individual classifiers from being preceded delimitive adjectives, but suggests that both delimitive adjectives in (39) can only modify the head noun *xianglian* ‘necklace’, the only element that has the feature [+Delimitable]. In (40), since the collective classifier *qun* and the head noun *yang* ‘sheep’ both have the feature [+Delimitable], they can both

be modifiees when they are preceded by a delimitive adjective. This explains why an available reading of 'big group of' and 'small sheep' are achieved.

(39) *san chang tiao duan xianglian [Individual CL]
three long CL.STRIP short necklaces

(40) san da qun xiao yang [Collective CL]
three big CL.GROUP small sheep
"three big groups of small sheep"

With regard to partitive and individuating classifiers, a similar approach is used to diagnose if they have the feature [+Delimitable]. In comparison to the examples of individual and collective classifiers above, delimitive adjectives must precede partitive and individuating classifiers, because they cannot grammatically precede the head nouns when these classifiers occur.

(41) san da pian xigua [Partitive CL]
three big CL watermelon
"three big slices of watermelon"

(42) *san pian da xigua [Partitive CL]
three CL big watermelon

(43) san da di you [Individuating CL]
three big CL oil
"three big drops of oil"

(44) *san di da you [Individuating CL]
three CL big oil

Xigua 'watermelon' has the feature [+Delimitable], and this indicates that (42) should be grammatical. However, it is ungrammatical to have the delimitive adjective precede the head noun when a partitive classifier is used, as is shown in (42). Similarly, when an individuating classifier is used, it is also illicit to have delimitive adjectives preceding the head noun. If the delimitive adjective precedes the head noun rather than the individuating classifier, the new phrase is ungrammatical, as illustrated in (43) and (44).

I argue that the restriction pattern on delimitive adjectives' syntactic position in the examples above indicates that partitive and individuating classifiers are the actual modifiees, whereas head nouns cannot be modified when they occur with individuating or partitive classifiers. Since partitive and individuating classifiers can also be actual modifiees, they have the feature [+Delimitable].

In summary, I propose that classifiers that cannot be directly preceded by delimtive modifiers have the feature [-Delimitable], and this includes kind and standard measure classifiers. With respect to those that can be directly preceded by delimitive adjectives, only the ones that can be actual modifiees have the feature [+Delimitable], and this includes individuating, collective, and partitive classifiers. Individual classifiers, despite being able to be directly preceded by delimtive adjectives, cannot be actual modifiees and thus do not have the delimitability feature.

6. The projections of UnitP and ClP

Recall Zhang's claim that differences in s-selection translate directly to constituent structure differences (p. 156). As discussed above, my proposal on s-selectional features accounts for the s-selection relation between classifiers and nouns, without needing different constituent structures. I propose that right-branching structure is sufficient to show how classifiers pattern with nouns and all types of classifiers in Mandarin are the realizations of the head CL in the ClP, and I will discuss how my approach can be extended to the analysis of Noun-Classifier compounds.

6.1 Noun-Classifier compounds

In Mandarin, *noun-classifier compounds* are comprised of a noun and classifier, such as the *niurou-pian* 'beef slices' in example (45) through (47). Although there is a classifier in a N-CL compound, a compound-external classifier is obligatory if a N-CL compound is combined with a numeral. As (47) illustrates, it is ungrammatical to directly combine a N-CL compound with a

numeral. Hence, two classifiers can simultaneously occur in numeral expressions that include a N-CL compound, as is shown in (45) and (46). When a N-CL compound occurs, the classifier following the numeral can be identical to the compound-internal classifier. Zhang claims that the compound-external classifiers are just copies of the compound-internal ones if they look the same, as in (46).

(45) yi he niurou-pian
one CL.BOX beef-CL.SLICE
'a box of beef slices'

(46) yi pian niurou-pian
one CL.SLICE beef-CL.SLICE
'one beef slice'

(47) *yi niurou-pian
one beef-CL.SLICE
intended: 'one beef slice'

6.1.1 Compound-internal classifiers

In Mandarin, most types of classifiers cannot stand alone without nouns or function as independent nouns except standard and container measure classifiers. For example, *pian* 'slice' in (45d), cannot occur in a subject position, like *niurou* 'beef' in (45c), which indicates that *pian* can only act as a classifier. In (45b), *pian* 'slice' is a pre-nominal classifier, preceding the head noun *niurou* 'beef'. In (45a), the pre-nominal classifier is the container measure classifier *he* 'box', and *pian* 'slice' is the classifier that combines with the head noun to form the N-CL compound *niurou-pian* 'beef slice'. In (45a) and (45b), *pian* 'slice' is an individuating classifier that occurs with the head noun niruou 'beef' which has the feature [-Delimitable]. This indicates that individuating classifiers can occur as both pre-nominal and compound-internal classifiers.

(45) a. yi he niurou-**pian** **[Individuating]**
one CL.BOX beef-CL.SLICE
'a box of beef slices'

b. yi **pian** niurou
one CL.SLICE beef
'a slice of beef'

c. Niurou hen haochi
beef very delicious
'Beef is very delicious.'

d.*Pian hen haochi
CL.SLICE very delicious
intended: 'slices are very delicious'

Similarly, individual, collective, partitive, and kind classifiers can all be compound-internal classifiers, as illustrated in example (48) through (51). The whole compound has a meaning that differs from the head noun if the compound-internal classifiers are individuating, collective, partitive, or kind classifiers, as is shown in (49) through (51). However, when compound-internal classifiers are individual classifiers, the whole compound and head noun have the same meaning, and there is no semantic difference between the Cl +N order and N-Cl compound, as in (48).

(48) a. yi **duo** hua **[Individual]**
one CL flower
'a flower'

b. yi ge hua-**duo**
one CL flower-CL
'a flower'

(49) a. yi **qun** yang **[Collective]**
one CL.GROUP sheep
'a group of sheep'

b. yi ge yang-**qun**
one CL sheep-CL.GROUP
'a sheep flock'

(50) a. yi **pian** xigua **[Partitive]**
one CL.SLICE watermelon
'a slice of watermelon'

b. yi pan xigua-**pian**
one CL.PLATE watermelon-CL.SLICE
'a plate of watermelon slices'

(51) a. yi **zhong** shu **[Kind]**
one CL.KIND tree
'one kind of tree'

b. san ge shu-**zhong**
three CL tree-CL.KIND
'three tree species'

With regard to standard and container measure classifiers, they can only occur as pre-nominal classifiers but not compound-internal classifiers. First, standard measure classifiers cannot be preceded by nouns. As is shown in (52b), if standard measure classifiers can be compound-internal classifiers, then the compound *xigua-gongjin* should have the same meaning as the noun *xigua* 'watermelon' or have a meaning related to *xigua* 'watermelon', like *xigua-pian* 'watermelon slices'. However, neither of these two types of meanings can be acquired.

(52) a. yi gongjin xigua
one CL.KILOGRAM watermelon
'a kilogram of watermelons'

b. *xigua-gongjin
watermelon-CL.KILOGRAM

Container measure classifiers, unlike other types of classifiers, can function as independent nouns when they do not occur with nouns. For example, *bei* 'cup' in (53a) occurs in a subject position like *kafei* 'coffee' in (53b), which indicates that it can act as a noun. However, when *bei* 'cup' precedes a noun, as in (53c), it acts as a container measure classifier.

(53) a. **bei** hen da **[Noun]**
cup very big
'The cup is very big.'

b. kafei hen ku
coffee very bitter
'Coffee is very bitter

c. yi **bei** kafei **[Container-measure CL]**
one CL.CUP coffee
'one cup of coffee'

d. **kafei-bei** hen da **[N-N compound]**
coffee-cup very big
'The coffee cup is very big.'

When container measure classifiers occur as the second member of a compound, as in (53d), I argue that they function as nouns rather than classifiers. In other words, they form a N-N compound (Noun-Noun compound) with the nouns preceding them. For example, in (53d), *bei* 'cup' is preceded by another noun. According to my proposal, *bei* 'cup' in (53d) functions as a noun and forms a N-N compound, *kafei-bei* 'coffee cup', with the noun preceding it. More importantly, *kafei-bei* refers to a drinking vessel that doesn't necessarily have coffee in it, which indicates that the compound has a meaning related to *bei* 'cup' rather than *kafei* 'coffee'. Hence, I conclude that container measure classifiers cannot be compound-internal classifiers.

In sum, most types of classifiers can be compound-internal classifiers and occur in compound forms except standard and container measure classifiers. I will present more evidence to support my argument that container measure classifiers must act as nouns rather than classifiers when they occur in compound forms in section 5.1.2.

6.1.2 Classifiers that precede N-CL compounds

In this section, I will further discuss what types of classifiers can be compound-external classifiers when N-CL compounds occur. First of all, the classifiers preceding N-CL compounds can have the same forms as the ones that occur in the compounds in Mandarin. When the compound-external and -internal classifiers have the same form, the compound-external classifier is always semantically redundant.

(54) a. san duo hua-**duo** **[Individual]**
three CL banana-CL.
'three flowers'

b. san di shui-**di** **[Individuating]**
three CL.DROP water-CL.DROP
'three waterdrops'

c. san qun yang-**qun** **[Collective]**
three CL.GROUP sheep-CL.GROUP
'three sheep flocks'

d. san pian xiangjiao-**pian** **[Partitive]**
three CL.SLICE banana-CL.SLICE
'three banana slices'

e. san zhong shu-**zhong** **[Kind]**
three CL.KIND tree-CL.KIND
'three tree species'

As (54) illustrates, if a classifier can be a compound-internal classifier, it can precede the compounds in which it acts as a compound-internal classifier. Zhang (2013) claims that the classifiers preceding the compounds are copies of the compound-internal classifiers and semantically redundant if they have the same form as the compound-internal ones'. She argues that classifiers that serve as "place-holders" of Unit are represented with the right-branching structure, regardless of what type of classifier they are. For example, according to Zhang's theory, the compound-external classifier *qun* 'group' in (54c) is a collective classifier that serves as a "place-holder", so it is represented with the right-branching structure. However, this contradicts her previous proposal that collective classifiers are represented with the left-branching structure.

As is discussed in section 5.1.1, N-CL compounds either have the same meaning as the head nouns' or have a meaning related to the head nouns. I argue that such patterns occur because a N-CL compound may inherit semantic properties from the head noun only or from both the

compound-internal classifier and the head noun. Specifically, the semantic properties inherited are the features of numerability and delimitability.

For example, in (54a), the compound *hua-duo* and the head noun *hua* have the same meaning, because the whole compound inherits the features [-Numerable] and [+Delimitable] from the noun, and the individual classifier *duo* does not project its feature to the whole compound. In (54b), the compound *shui-di* has a meaning of 'waterdrop' which is related to the head noun's meaning but not identical, and I argue that this is because *shui-di* inherits semantic properties from both the classifier *di* 'drop' and the noun *shui* 'water': the head noun *shui* 'water' projects its [-Numerability] feature to the whole compound, and the individuating classifier *di* 'drop' projects its [+Delimitable] feature to the whole compound.

(54b) san **di** shui-di **[Individual]**
three CL.DROP water-CL.DROP
'three waterdrops'

(55) san **di** shui **[Individuating]**
three CL.DROP water
'three drops of water'

The noun *shui* 'water' does not have a natural unit because it has the feature [-Delimitable], so *di* 'drop' is used as an individuating classifier in (55). In (54b), the N-CL compound *shui-di*, unlike the noun *shui* 'water', has the feature [+Delimitable] because it can be modified by delimitive adjectives, for instance, *da shui-di* 'big waterdrops'. Since the noun *shui* 'water' has the feature [-Delimitable], the compound *shui-di* can only inherit the feature [+Delimitable] from the classifier *di* 'drop'. With the feature [+Delimitable], the compound *shui-di* cannot be preceded by individual classifiers.

(54b) san **di** shui-di **[Individual]**
three CL.DROP water-CL.DROP
'three waterdrops'

(55) san **di** shui **[Individuating]**
three CL.DROP water
'three drops of water'

Hence, the compound-external *di* 'drop' in (54b) is not an individuating classifier, being different from the *di* 'drop' that occurs in the compound. Recall that individual classifiers are used when the counting unit is the same as the natural unit of the objects, and I propose that the compound-external *di* 'drop' acts as an individual classifier, which refers to the counting unit being equal to the natural unit of the object, *shui-di* 'water-drop'. It is common that individual classifiers are semantically vacuous or semantically redundant, as is shown in (56).

(56) a. san tiao yu
three CL.STRIP fish
'three fish'

b. san zhi songshu
three CL.ANIMAL squirrel
'three squirrels'

c. san ba dao
three CL.HANDHELD knife
'three knives'

More importantly, a classifier can be an individual or individuating classifier, depending on the noun they occur with. For example, *gen* is an individual classifier in (57a) but an individuating classifier in (57b). Therefore, it is plausible to argue that the compound-external *di* in (54b) is an individual classifier, and it is obligatory because the compound *shui-di* inherits the feature [-Numerable] from the noun *shui*, which prevents it from being directly combined with numerals.

(57) a. yi **gen** gangbi **[Individual]**
one CL pen
'a pen'

b. yi **gen** mutou **[Individuating]**
one CL wood
'a piece of wood'

Similarly, N-CL compounds that have collective and partitive classifiers as compound-internal classifiers also inherit semantic properties from both the classifiers and the nouns because they also have different semantic interpretations from the head nouns'. For example, the compound *yang-qun* in (58a) differs from the noun *yang* in meaning: *yang-qun* refers to a flock of sheep, and *yang* refers to an individual sheep, so their natural units also differ from one another. The natural unit of *yang* 'sheep' is *zhi*, as is shown in (58b), and the individual classifiers *zhi* cannot be used to refer to the natural unit of the compound yang-qun 'sheep flock', as in (58c). I argue that the compound-external *qun* in (58a) is an individual classifier rather than a collective classifier and it refers to the natural unit of the compound *yang-qun* 'sheep flock'. Similarly, the *pian* that preceding the compound in (59a) is an individual classifier, referring to the natural unit of *xiangjiao-pian*, while the natural unit of *xiangjiao* is denoted with the individual classifier *ge*, as is shown in (59b).

(58) a. san **qun** yang-qun **[Individual]**
three CL.GROUP sheep-CL.GROUP
'three sheep flocks'

b. san zhi yang
three CL sheep
'three sheep'

c. *san zhi yang-qun
three CL sheep-CL.GROUP
intended: three sheep/sheep flocks

(59) a. san **pian** xiangjiao-pian **[Individual]**
three CL.SLICE banana-CL.SLICE
'three banana slices'

b. san ge xiangjiao
three CL banana
'three bananas'

In previous section, I argued that container measure classifiers cannot be compound-internal classifiers. One piece of evidence that supports my claim is the fact that container measure classifiers cannot be used as semantically vacuous compound-external classifiers if they have the identical form as the compound-internal ones'. For example, if *bei*, as a classifier, can combine with a noun and form a N-CL compound, it should be grammatical to have another *bei* precede the compound and the compound-external *bei* should be semantically vacuous. However, as (60) illustrates, it is ungrammatical for *bei* to occur as a compound-internal classifier and simultaneously have another *bei* precede the compound.

(60) *yi bei kafei-bei
one CL.CUP COFFEE-CL.CUP

(61) ?yi bei kafei-bei
one CL.CUP coffee-cup
'a cup of coffee cups'

In certain contexts, it may be grammatical for a *bei* to occur in a compound and have another *bei* precede the compound, as in (61). For example, there are a couple of tiny toy coffee cups for dolls and a big coffee cup that people use in real life. With a context where someone just put the tiny coffee cups into the big coffee cup, (61) is grammatical. Nonetheless, the *bei* preceding the compound is not semantically vacuous or redundant but still acts as a container measure classifier. Hence, the pattern supports my argument that container measure classifiers cannot be compound-internal classifiers: they function as nouns when they combine with other nouns to form N-N compounds.

Classifiers preceding N-CL compounds do not necessarily need to have the same form as the compound-internal classifiers. As (62) illustrates, kind, collective, standard and container measure classifiers can also precede N-CL compounds.

(62) a. san **zhong** niurou-pian **[Kind]**
three CL.KIND beef-CL.SLICE
'three kinds of beef slices'

b. san **chuan** shui-di **[Collective]**
three CL.ROW water-CL.DROP
'three rows of waterdrops'

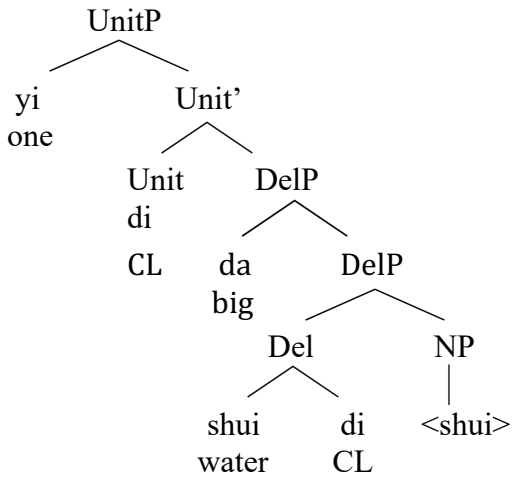
c. san **bang** niurou-pian **[Standard measure]**
three CL.POUND beef-CL.SLICE
'three pounds of beef slices'

d. san **he** niurou-pian **[Container measure]**
three CL.BOX beef-CL.SLICE
'three boxes of beef slices'

6.2 The position of compound-internal classifiers

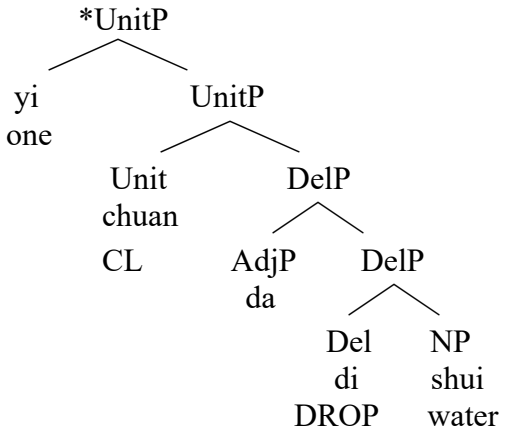
Zhang claims that a functional projection DelimitP projects when N-CL compounds occur. She argues that compound-internal classifiers are the realizations of the Del head, as is shown in (63). According to her theory, all compound-internal classifiers project their delimitability features to the whole compound. In other words, the delimitability feature of N-CL compounds is determined by compound-internal classifiers. As (63) illustrates, the whole compound *shui-di*, despite having a noun with the feature [-Delimitable], can still be preceded by the delimitive adjective *da* 'big', and she uses such patterns as a piece of evidence to support her argument that N-CL compounds inherit the feature of delimitability from compound-internal classifiers rather than the head nouns.

(63) yi di da shui-di
one CL.DROP big water-CL.DROP
'a big waterdrop'



Recall that she argues all pre-nominal classifiers are the realizations of the head in the UnitP in Mandarin, but she proposes that compound-internal classifiers are the realizations of Del. According to Zhang's theory, some classifiers can only project their delimitability feature to the maximal projection DelP. If this were true, then we would expect that it is also possible for other classifiers to only project their numerability feature to the maximal projection UnitP, and Zhang has to claim that DelP only exists in N-Cl compounds. If DelP were available in non-compounds, it should be possible to have a sequence of adjacent classifiers in one numeral expression: one is the realization of the head in the UnitP, projecting the feature [+Numerable] to license the occurrence of numerals, and the other is the realization of the head in the DelP, projecting the feature [+Delimitable] to license the occurrence of delimitive adjectives. For example, (64) is predicted to be grammatical because the first classifier *chuan* being the realization of Unit licenses the numeral *yi* 'one'. The second classifier *di* being the realization of Del licenses the delimitive adjective *da* 'big'. However, (64) is ungrammatical, and Zhang has to assume that DelP only exists in N-Cl compounds to avoid this incorrect pattern.

(64) *yi chuan da di shui
one CL.ROW big CL.DROP water
intended: 'a row of drop of water'



Second, Zhang proposes the projection of DelP because she argues that all compound-internal classifiers contribute their delimitability to the whole compound, based on the assumption that all classifiers have the feature [+Delimitable] except Kind classifiers. However, as discussed in Section 4, I argue that individual classifiers, like *duo* in (64) and (65), do not have the delimitability feature. If individual classifiers do not have the delimitability feature, then they cannot be generated at the Del head. This would suggest that DelP does not project when individual classifiers form a compound with nouns. Additionally, as (65) illustrates, it is grammatical to have the compound *hua-duo* preceded by the delimitive adjective *da* 'big', so I argue that the compound *hua-duo* has the feature [+Delimitable], and it inherits the feature [+Delimitable] from the noun *hua* 'flower'.

(64) yi da duo hua
one big CL flower
'a big flower'

(65) da hua-duo
big flower-CL
'big flower'

With regard to other types of compound-internal classifiers, I argue that they project their delimitability features to the whole compound. As is illustrated in example (66) through (68), individuating, collective, and partitive classifiers all have the feature [+Delimitable], and the

compounds they occur in are also able to be modified by delimitive adjectives. In (69), the kind classifier *zhong* has the feature [-Delimitable], and the compound *shu-zhong* cannot be modified by the delimitive adjective *da* 'big'. These examples indicate that N-CL compounds that consist of individuating, collective, partitive, and kind classifiers inherit the delimitability feature of the classifier.

(66) da shui-pian [Individuating]
big water-CL.DROP
'big waterdrop'

(67) da yang-qun [Collective]
big sheep-CL.GROUP
'big sheep flock'

(68) da xiangjiao-pian [Partitive]
big banana-CL.SLICE
'big banana slices'

(69) *da shu-zhong [Kind]
big tree-species
intended: 'big tree species'

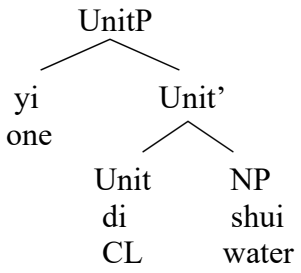
In sum, I propose that compound-internal classifiers determine the delimitability of N-CL compounds only if they are not individual classifiers. If a compound-internal classifier is an individual classifier, the whole compound inherits the delimitability feature from the noun. The delimitability feature of individual classifiers lead to the incompatibility between Zhang's proposal and mine. If my proposal is correct, then the projection of DelP will not be able to explain the pattern of individual classifiers when they occur as compound-internal classifiers.

6.3 The projections of UnitP and ClP

Recall that Zhang proposes all classifiers are the realizations of the Unit head, and numerals are the specifiers of the UnitP. According to her theory, classifiers and numerals must co-occur, as

is shown in (65). However, classifiers may occur independently without numerals. For example, N-CL compounds can function as independent nouns, as is illustrated in (66a).

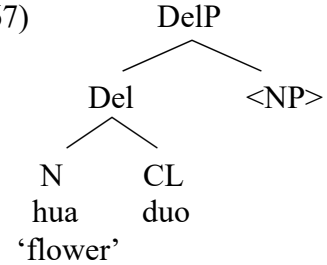
(65) yi di shui
one CL.DROP water
'a drop of water'



(66) hua-duo shi meili-de
flower-CL be beautiful
'Flowers are beautiful.'

Zhang does not discuss situations where N-CL compounds function as independent nouns without numerals. According to her theory, the compound *hua-duo* in (66) should be represented with the structure in (67). However, as is discussed above, I propose that individual classifiers have the feature [-Delimitable]. If my proposal is correct, Zhang's proposal on DelP predicts that the compound *hua-duo* cannot be modified by delimitive adjectives. However, the compound *hua-duo* can be modified by delimitive adjectives, as in (68).

(67)



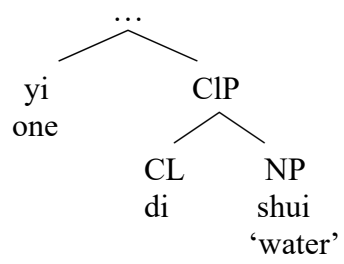
(68) da hua-duo
big flower-CL
'big flowers'

Additionally, I argue that the delimitability feature is not the only feature projected to the compounds. Since N-CL compounds cannot directly combine with numerals, I argue that they

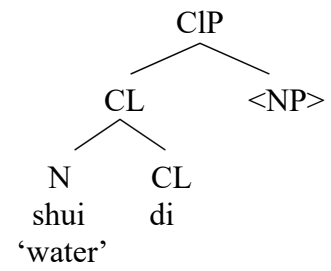
have the feature [-Numerable] which is projected by the head nouns. In other words, the projection of DelP only accounts for the delimitability feature but not the numerability feature.

I propose that one projection is sufficient to explain the syntactic positions of all classifiers in Mandarin, regardless of whether they are pre-nominal classifiers or compound-internal classifiers. Specifically, I propose that all types of classifiers are the realizations of the head of ClP which c-commands the head noun in NP, as is shown in (69), including both compound-internal and external classifiers. N-CL compounds are created through the head movement of the nouns to CL head, as is shown in (70). Unlike Zhang's use of DelP where classifiers determine the delimitability feature of the whole compounds, ClP does not place the restriction that only classifiers project their delimitability features to the whole compound. The head nouns can also project their features to the ClP, which may determine the features of the whole compounds.

(69) yi di shui
one CL.DROP water
'one drop of water'



(70) shui-di
water-CL.DROP
'waterdrop'

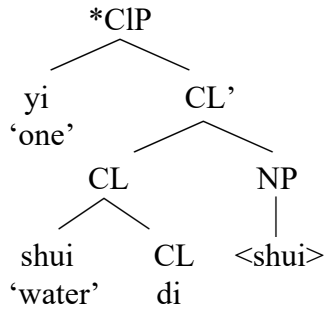


When head nouns do not undergo head movement to CL, classifiers surface pre-nominally. Pre-nominal classifiers, unlike compound-internal classifiers, have to occur with numerals, as is shown in (71).

(71) *di shui
CL.DROP water
'drop of water'

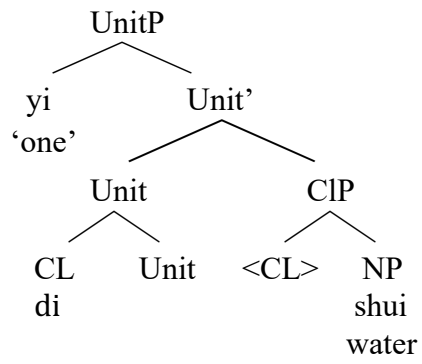
However, ClP by itself cannot license the occurrence of numerals, because a compound-external classifier is obligatory when N-CL compounds combine with numerals. If ClP is sufficient to license the occurrence of numerals, having numerals as its specifiers, as is shown in (72), then we would predict that N-CL compounds like *shui-di* 'waterdrop', can directly combine with numerals. However, it is ungrammatical to have numerals directly precede N-CL compounds: another classifier is required when they combine with numerals.

(72) *yi shui-di
one water-CL.DROP
intended: 'one water drop'



Hence, I propose that another functional projection is required to license the occurrence of numerals in Mandarin numeral expressions rather than the ClP. Specifically, I adopt the label of UnitP from Zhang's proposal as the functional projection. UnitP has the ClP as its complement and a numeral as its specifier, as is shown in (73).

(73) yi di shui
one CL.DROP water
'a drop of water



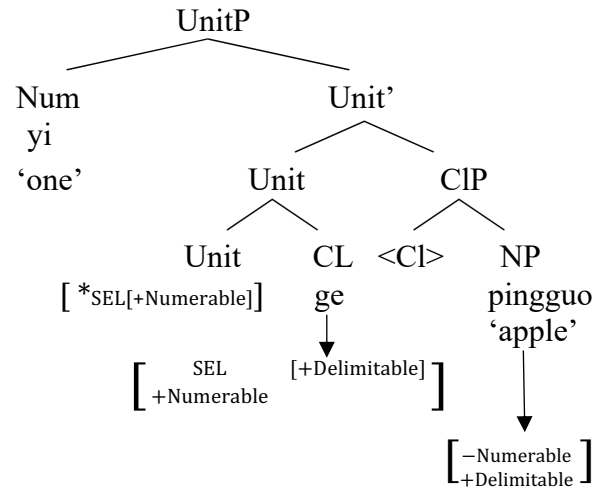
Unlike Zhang's proposal, I argue that all types of classifiers are represented with the right-branching structure, first generated in the CL head, and the CL head undergoes head movement to Unit head eventually, as is shown in (73). I will explain why the head movement of the classifier happens in section 6.4. UnitP is a functional projection that licenses the occurrence of numerals, having numerals as its specifiers. If UnitP projects, then there must be a pre-nominal classifier. However, when N-CL compounds are created and occur without numerals, UnitP does not project.

6.4 Head movement of CLs

In previous section, I proposed that UnitP and ClP have distinct functions in numeral expressions. As discussed above, classifiers are the realizations of the head of ClP, and UnitP is a functional projection that licenses the occurrence of numerals in its specifier. Numerals are specifiers of a different type of projection rather than ClP, but pre-nominal classifiers still need to occur with numerals. This indicates that classifiers have to occur in UnitP, and one way to account for this is by movement of the CL head to the Unit head. I propose that the head Unit has a strong selectional feature, *SEL[+Numerable], which searches for an element that has the feature [+Numerable]. Unlike other selectional features discussed, such as SEL[+Delimitable] and SEL[-Delimitable], the selectional feature of Unit is strong, which requires its selectee to be in local configuration, and thus triggering the head movement (Chomsky, 1993). For example, in (74), the individual classifier *ge* is selected by Unit because it has the inherent feature [+Numerable], so it

undergoes head movement to the head Unit to satisfy its strong selectional feature *SEL[+Numerable].

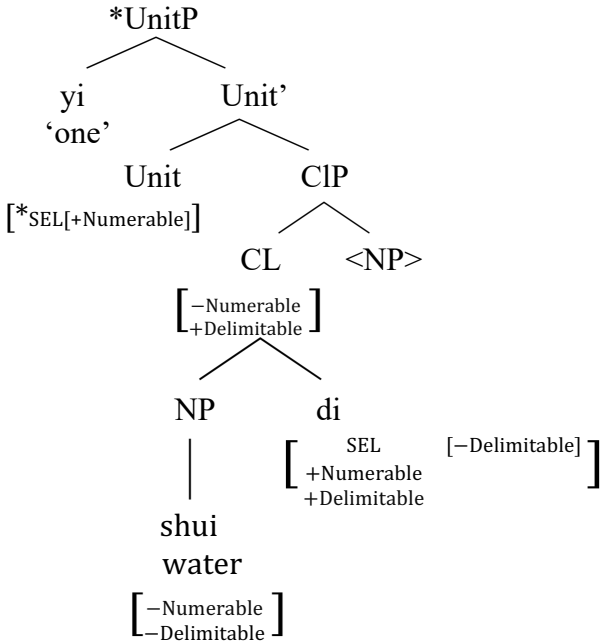
(74) yi ge pingguo
one CL apple
"an apple"



As is discussed above, all classifiers in Mandarin have the feature [+Numerable], but not all classifiers can undergo head movement to Unit. Specifically, compound-internal classifiers, despite having the feature [+Delimitable], cannot undergo head movement. I propose that head nouns in the head CL having the feature [-Numerable] prevent the head Unit from searching for the classifiers' [+Numerable] feature, because they have the feature [-Numerable].

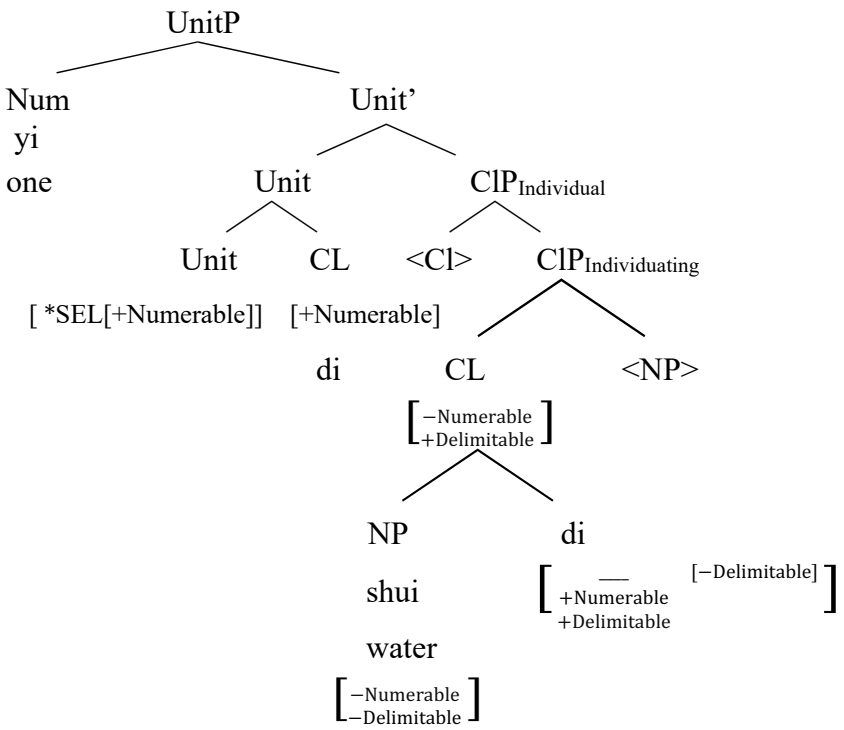
Recall that N-CL compounds cannot directly combine with numerals, and this indicates that the numerability feature of the whole compounds is [-Numerable]. Since all classifiers in Mandarin have the feature [+Numerable], N-CL compounds can only inherit the feature [-Numerable] from the nouns. In other words, nouns determine the numerability feature of whole compounds, projecting the feature [-Numerable] to the head CL, as is shown in (75). Additionally, this also accounts for the fact that a compound-external classifier is obligatory if the N-CL compound occurs with a numeral.

(75) *yi shui-di
one water-CL.DROP
intended: ‘one water drop’



Compound-external classifiers, as pre-nominal classifiers, do not include a noun that has the feature [-Numerable], so they project their [+Numerable] feature to the head CL of the higher ClP. For example, in (76), the compound-external classifier *di* projects its [+Numerable] feature to the head CL of the higher ClP, whereas the noun *shui* ‘water’ projects the feature [-Numerable] to the head CL of the lower ClP. Hence, the *di* that is the head CL of the higher ClP head-moves to Unit and checks its strong selectional feature.

(76) yi di shui-di
one CL.DROP water-CL.DROP
‘one water drop’



6.5 The distinctness condition on ClPs

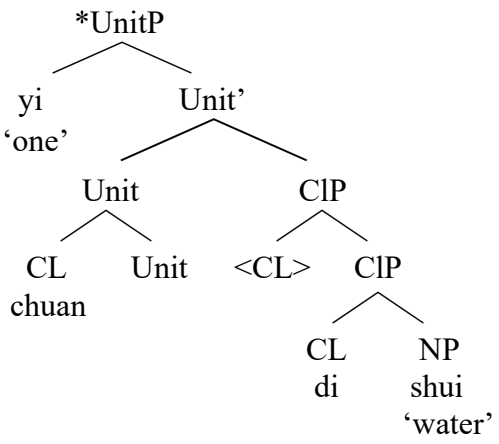
As discussed in previous sections, the examples of N-CL compounds indicate that it is possible to have multiple classifiers co-occur in one nominal expression. However, a sequence of adjacent classifiers in Mandarin is prohibited, as is shown in (78). Head nouns in Mandarin require exactly one pre-nominal classifier when they combine with numerals, as is shown in (77). Such pattens can be accounted for by the proposed Distinctness condition on linearization (Richards, 2010), which prohibits similar syntactic objects from being linearized within the same spell-out domain.

(77) yi di shui
one CL.DROP water
'one water drop'

(78) *yi chuan di shui
one CL.ROW CL.DROP water
intended: 'three rows of water drops'

It seems that my proposal on the projections of two ClPs would permit (78) being a grammatical example, as is shown in (78a). However, in my proposal, two ClPs only occur if N-CL compounds are created: compound-external classifiers are base-generated in the higher ClP, and compound-internal classifiers are base-generated in the lower ClP, being the complement of the higher ClP, as is shown in (79). I argue that two classifier projections can surface next to one another when N-CL compounds occur because they do not violate the Distinctness condition. One approach to account for the non-violation is that both head nouns and compound-internal classifiers project their features to the CL head of the lower ClP, making it featurally distinct from the higher ClP.

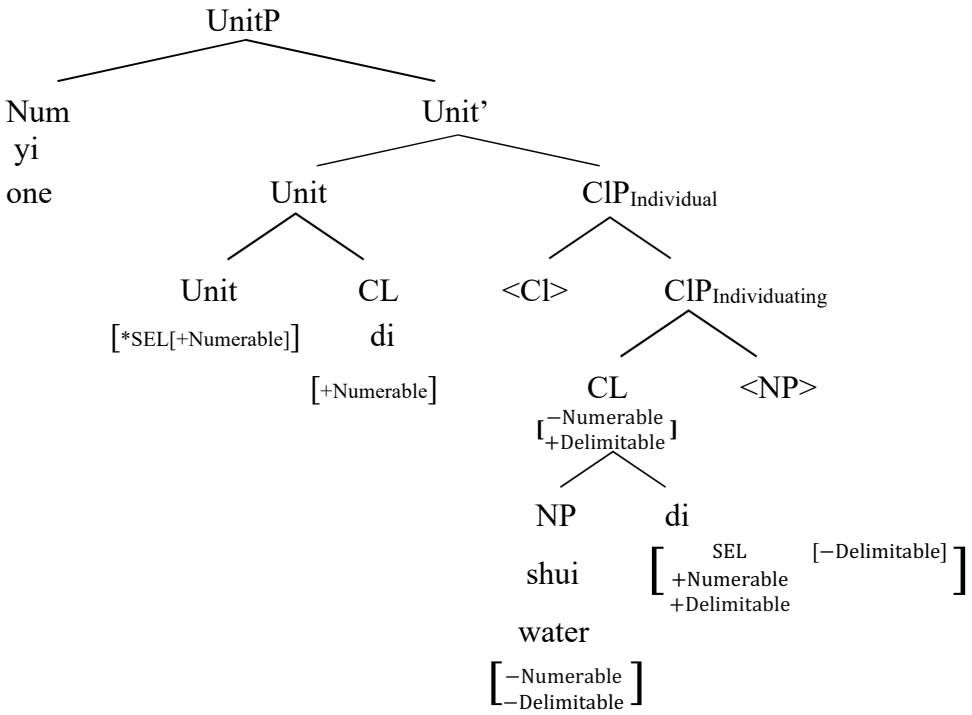
(78a) *yi chuan di shui
one CL.ROW CL.DROP water
intended: 'three rows of water drops'



As (79) illustrates, the head noun *shui* 'water' contributes its numerability to the whole compound, and the compound-internal classifier *di* 'drop' contributes its delimitability to the whole compound. Hence, the features projected to the lower ClP are [-Numerable] and [+Delimitable]. In the higher ClP, however, only the compound-external classifier *di* 'drop' projects its features to the ClP, so the higher ClP has the features [+Numerable] and [+Delimitable]. Since the higher and lower ClP

are featurally distinct, they do not violate the Distinctness condition and are able to surface next to one another.

(79) yi di shui-di
one CL.DROP water-CL.DROP
'one water drop'



7. Conclusion

In this thesis, I have argued for a unified right-branching structure that accounts for the constituency and syntactic positions of classifiers in Mandarin. Unlike the unified left-branching account (e.g., Huang 1982, Her 2012, Her & Tsai 2020), and the split approach (Y.-H. A. Li 2013, X. Li 2013, Zhang 2013), I propose that a functional projection UnitP projects to license the occurrence of numerals and that all types of classifiers are identified as the head of ClP. Contra other accounts of UnitP that classifiers are the realizations of a single head Unit (Zhang 2013, Hsu 2015), I claim that UnitP and ClP are distinct projections because ClP can occur without numerals when Noun-Classifier compounds are created. I use feature checking among s-selectional features to account for variation in the left-peripheral scope of delimitive adjectives in numeral expressions, contra Zhang's (2013) argumentation that distinct constituent structures of classifiers result in different scope relations. The proposed structure correctly predicts patterns on how classifiers may combine with nouns and numerals, including pre-nominal and compound-internal classifiers, and it also supports the Distinctness condition proposed by Richards (2011).

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